Assessment of Marine Sand Resources and Economic Heavy Minerals on Virginia's Outer Continental Shelf

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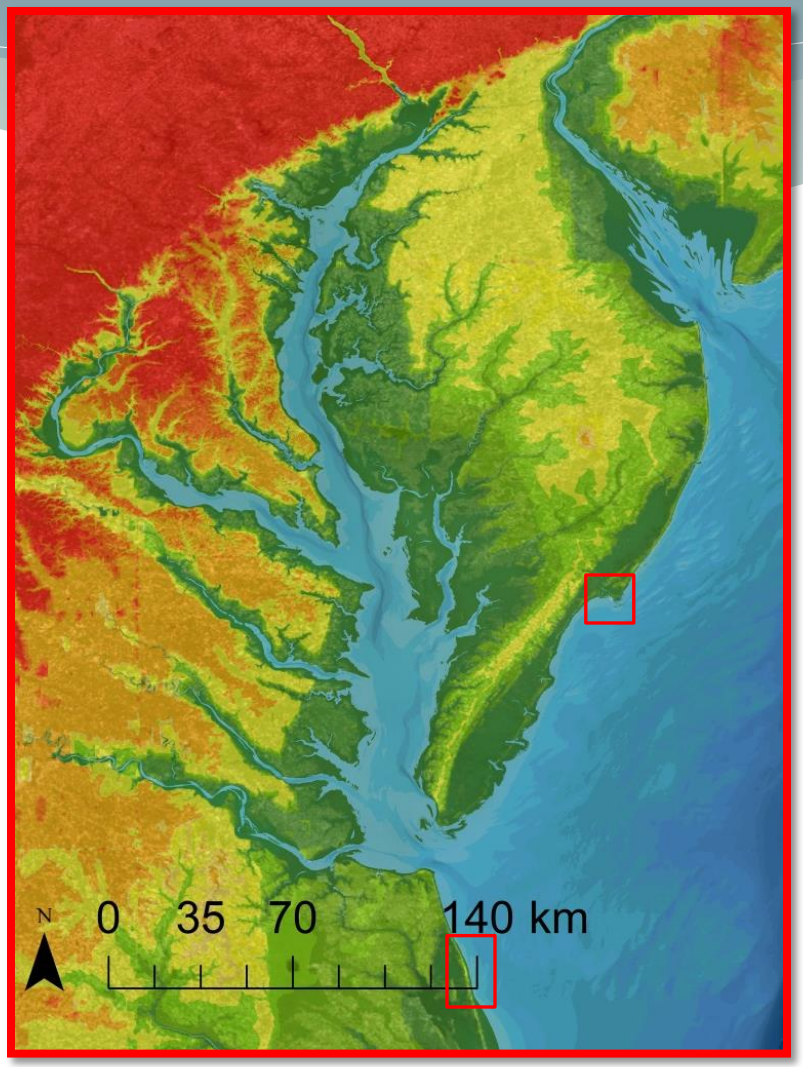
DMME
Virginia Department of Mines Minerals and Energy

Hurricane Sandy

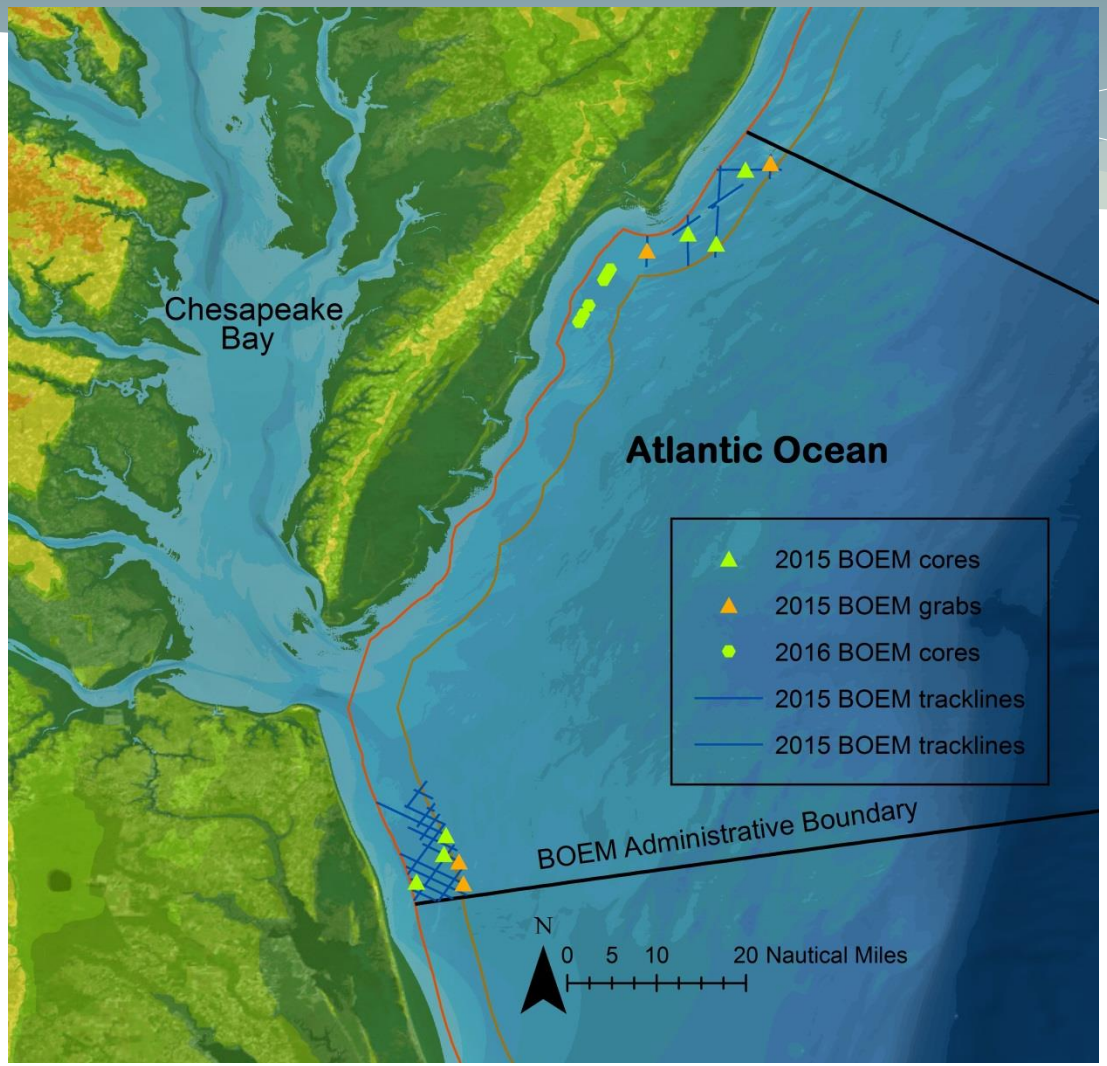
- **Jan 2013** – BOEM received $13.6 million for coastal resiliency studies and sand resource evaluation from Federal Disaster Relief Appropriations Act
- **April 2014** – 13 cooperative agreements with state geological surveys
- **2015** - BOEM awarded $5 million contract to CB&I to conduct Atlantic Sand Assessment Project, 3-8 nautical mile strip from Maine to Florida.

Purpose of Study

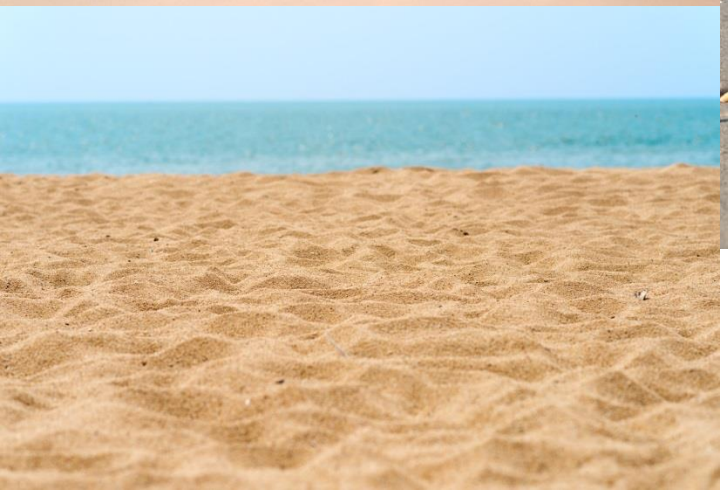
- Determine the quality and volume of sand resources in 2 study areas
  - Wallops Island
  - Sandbridge Beach
- Heavy Mineral Analysis
- Synthesize existing and newly available offshore Geodata



Project Location area 3-8 nautical miles offshore



What is Beach Quality Sand ?

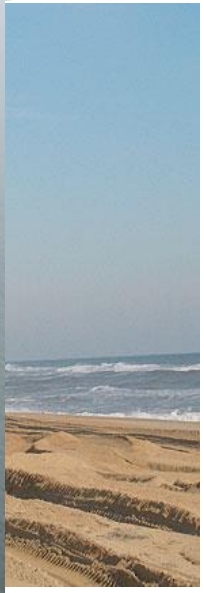


Beach Quality Sand for VA

- Wallops Island, VA
  - Sand: poorly or well sorted
  - containing no more than 10% fines passing through a #200 sieve (0.074 mm)
- Sandbridge, VA
  - 50% greater than .2 mm, preference is .25 mm
  - Color does not matter
- Client specification
  - Low shell content
  - Low rock content
  - Low iron-oxide

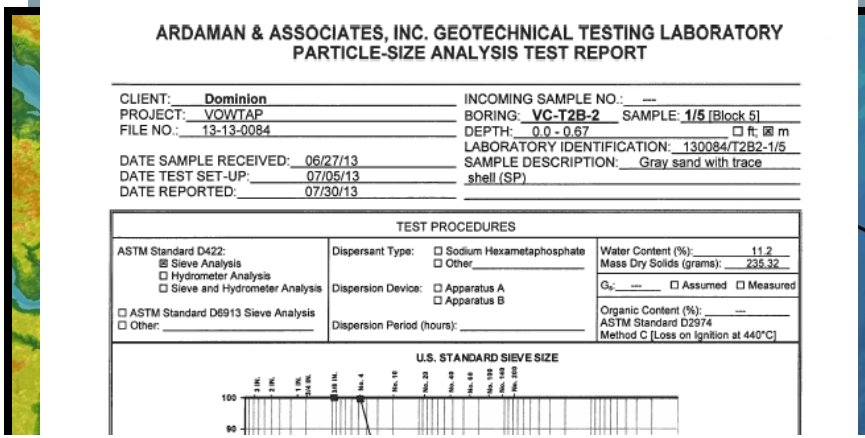
Beach Nourishment

http://www.climat



https://www.nasa.gov/centers/wallops/news/beach.html

How do we find beach-quality sand?



ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
PARTICLE-SIZE ANALYSIS TEST REPORT

CLIENT: Dominion
PROJECT: VOWTAP
FILE NO.: 13-13-0084

DATE SAMPLE RECEIVED: 06/27/13
DATE TEST SET-UP: 07/05/13
DATE REPORTED: 07/30/13

INCOMING SAMPLE NO.: ---
BORING: VC-T2B-2 SAMPLE: 1/5 [Block 5]
DEPTH: 0.0 - 0.67 ☐ ft; ☒ m
LABORATORY IDENTIFICATION: 130084/T2B2-1/5
SAMPLE DESCRIPTION: Gray sand with trace shell (SP)

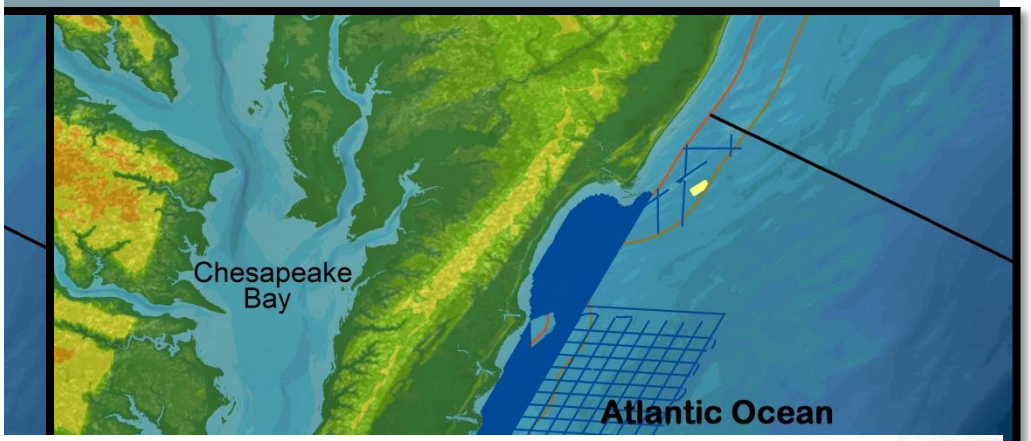
TEST PROCEDURES

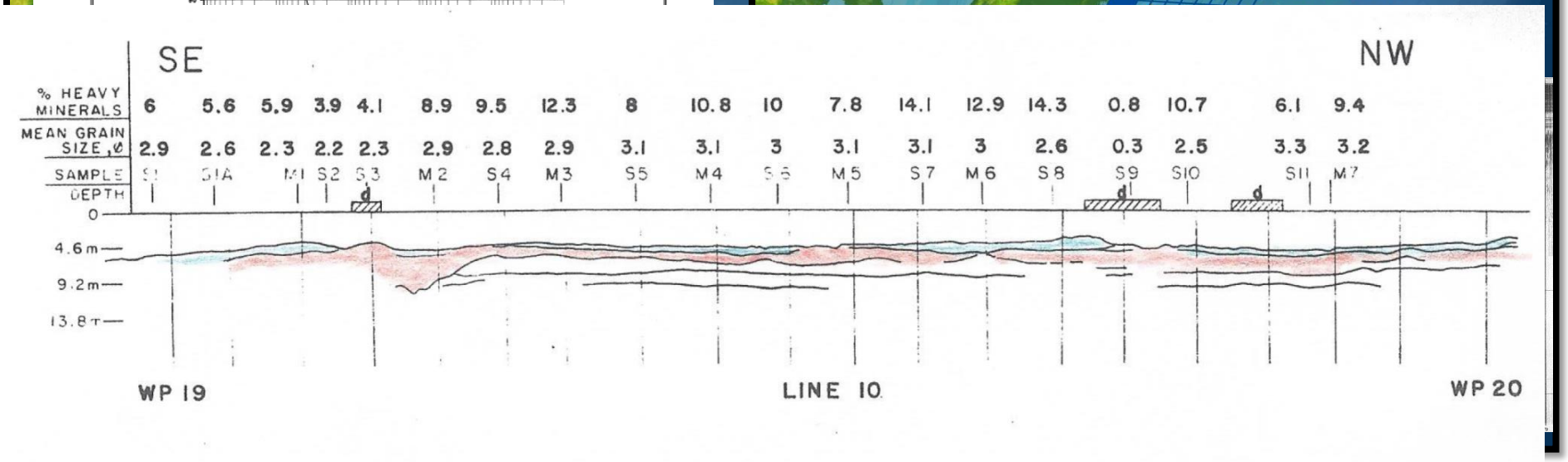
ASTM Standard D422:
☒ Sieve Analysis
☐ Hydrometer Analysis
☐ Sieve and Hydrometer Analysis
☐ ASTM Standard D6913 Sieve Analysis
☐ Other:

Dispersant Type: ☐ Sodium Hexametaphosphate ☐ Other
Dispersion Device: ☐ Apparatus A ☐ Apparatus B
Dispersion Period (hours):

Water Content (%): 11.2
Mass Dry Solids (grams): 235.32
G_s: --- ☐ Assumed ☐ Measured
Organic Content (%): ---
ASTM Standard D2974
Method C [Loss on Ignition at 440°C]

U.S. STANDARD SIEVE SIZE





- Offshore geologic correlation and interpretation (where there is a sufficient amount of data)

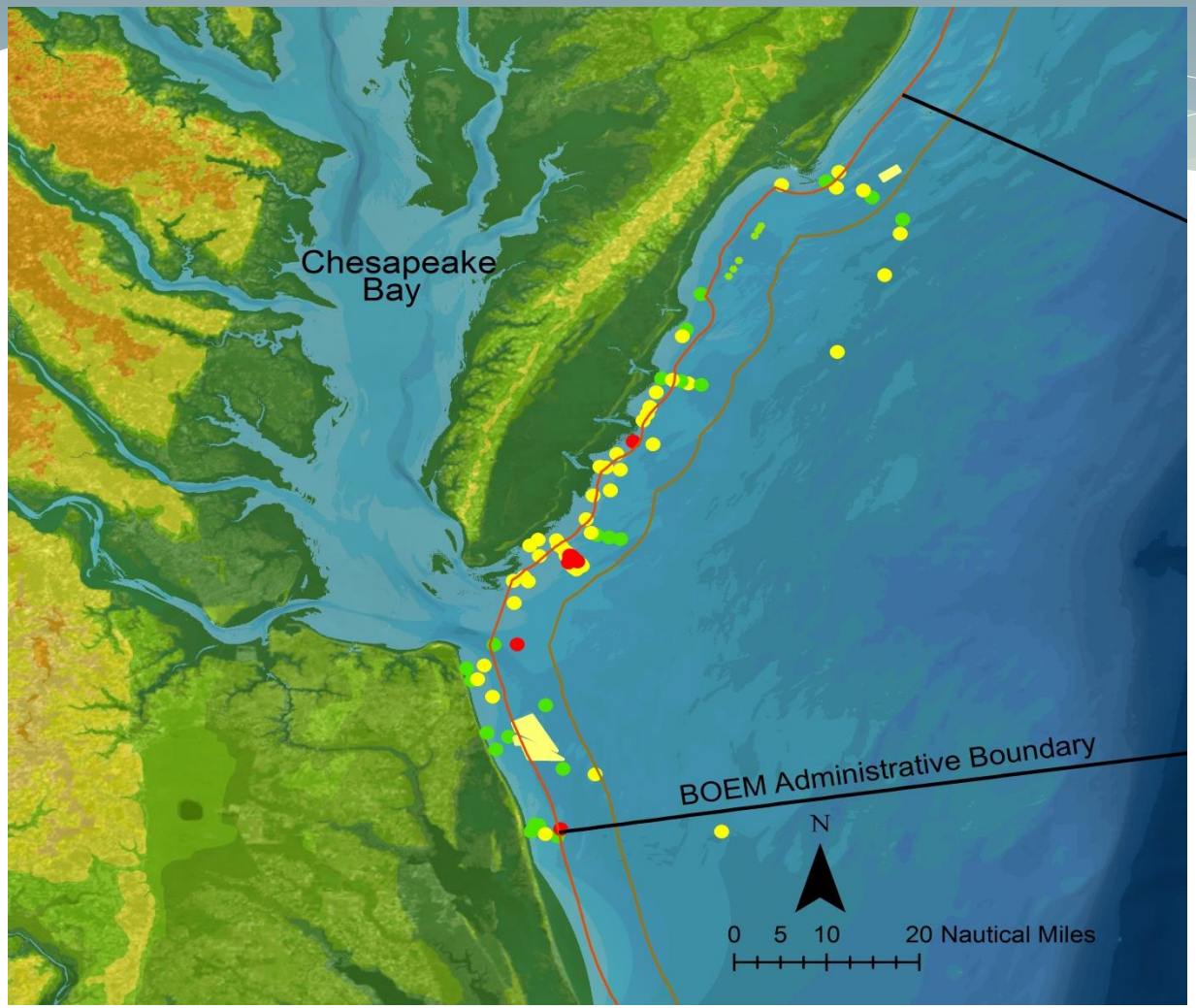
Ancient Beach Sands

- Iluka Resources has mined Pliocene beach sands since early 1990s; estimated $2.5 billion in zircon and ilmenite

Mineral Exploration Offshore

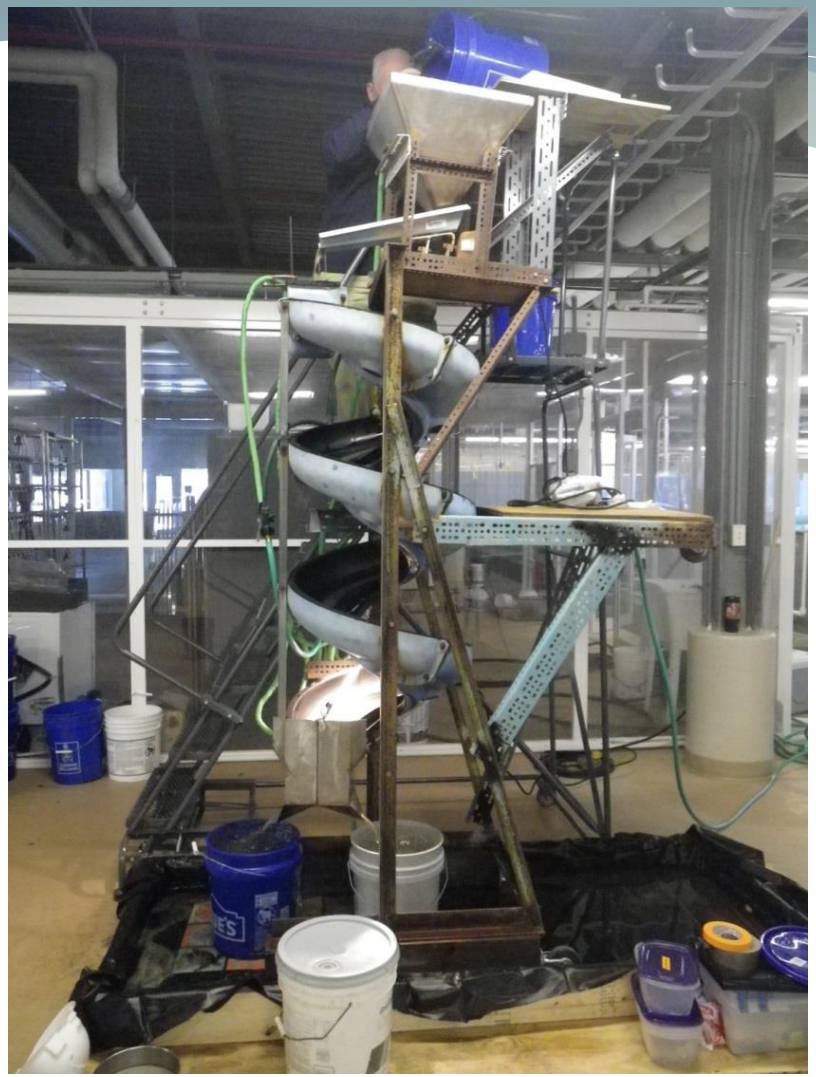
Minerals	Garnar, 1978	Iluka Resources Old Hickory
Ilmenite - $FeTiO_3$	(45%)	(54-68%)
Leucoxene - alteration product of $FeTiO_3$	(5%)	(1-2%)
Rutile - TiO_2	(2%)	(1-3%)
Zircon - $ZrSiO_4$ (minor U, Th, Pb, Hf, Y/REE)	(5%)	(15-21%)
Monazite - $(Ce,La,Nd,Y,Th,U)PO_4$	(1%)	
Staurolite - $(Fe,Mg,Zn)_2AL_9Si_4O_{23}(OH)$	(20%)	
Sillimanite group minerals - Al_2SiO_5	(7%)	

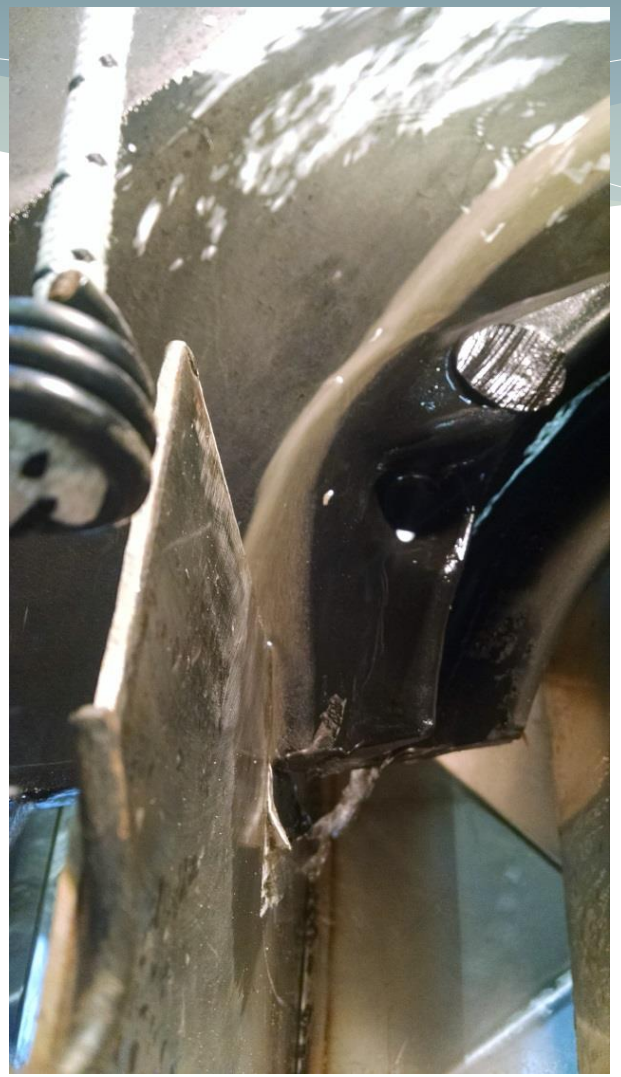
THM in many samples exceed the 2% economic threshold

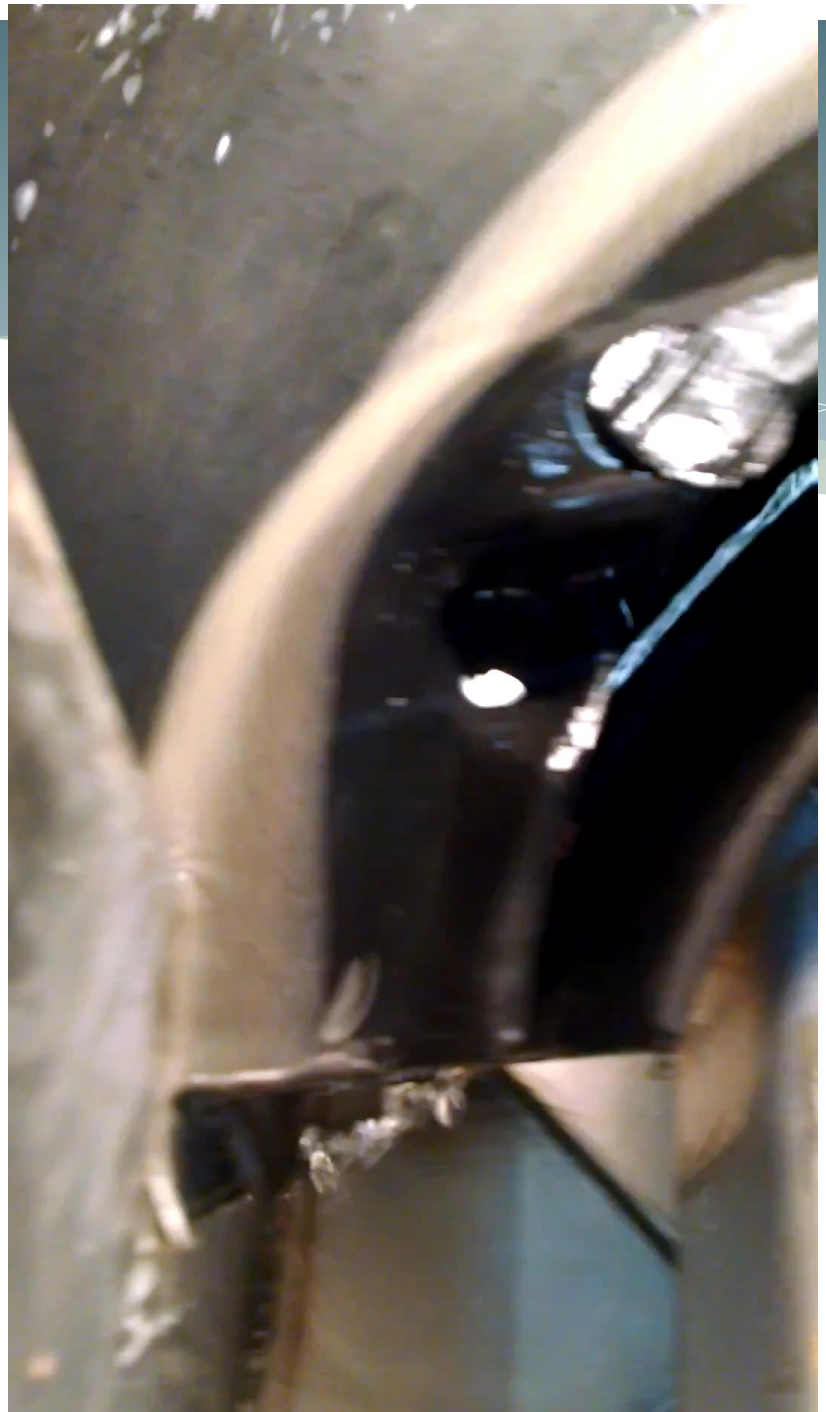


- Red > 10%
- Yellow > 5% < 10%
- Green >2% < 5%

Spiraling Heavy Mineral Concentrate







Geologic Framework

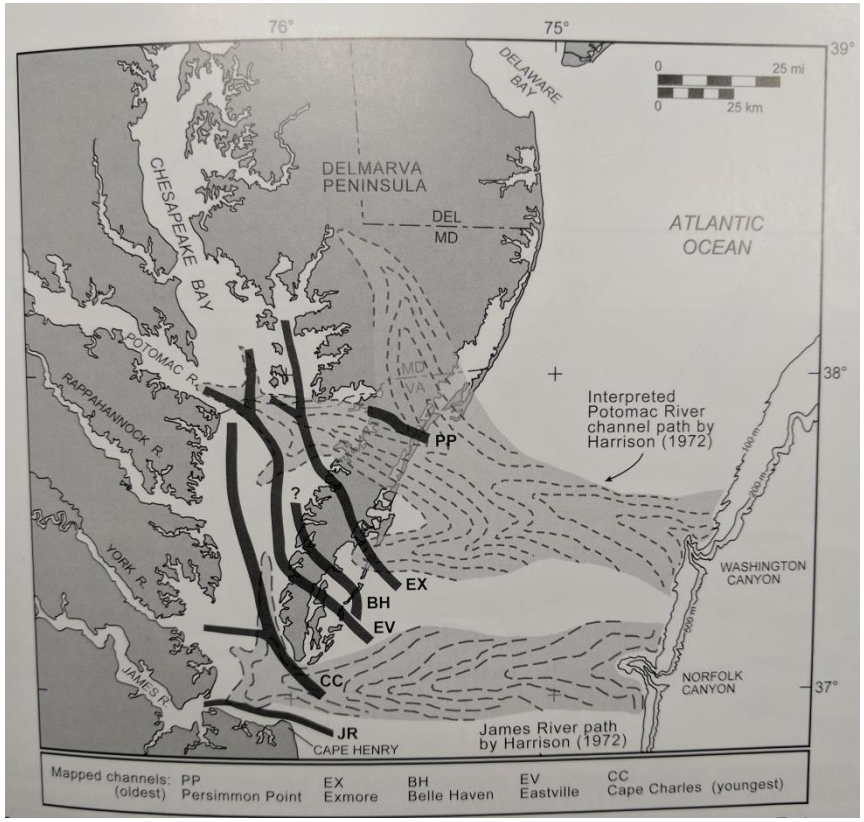
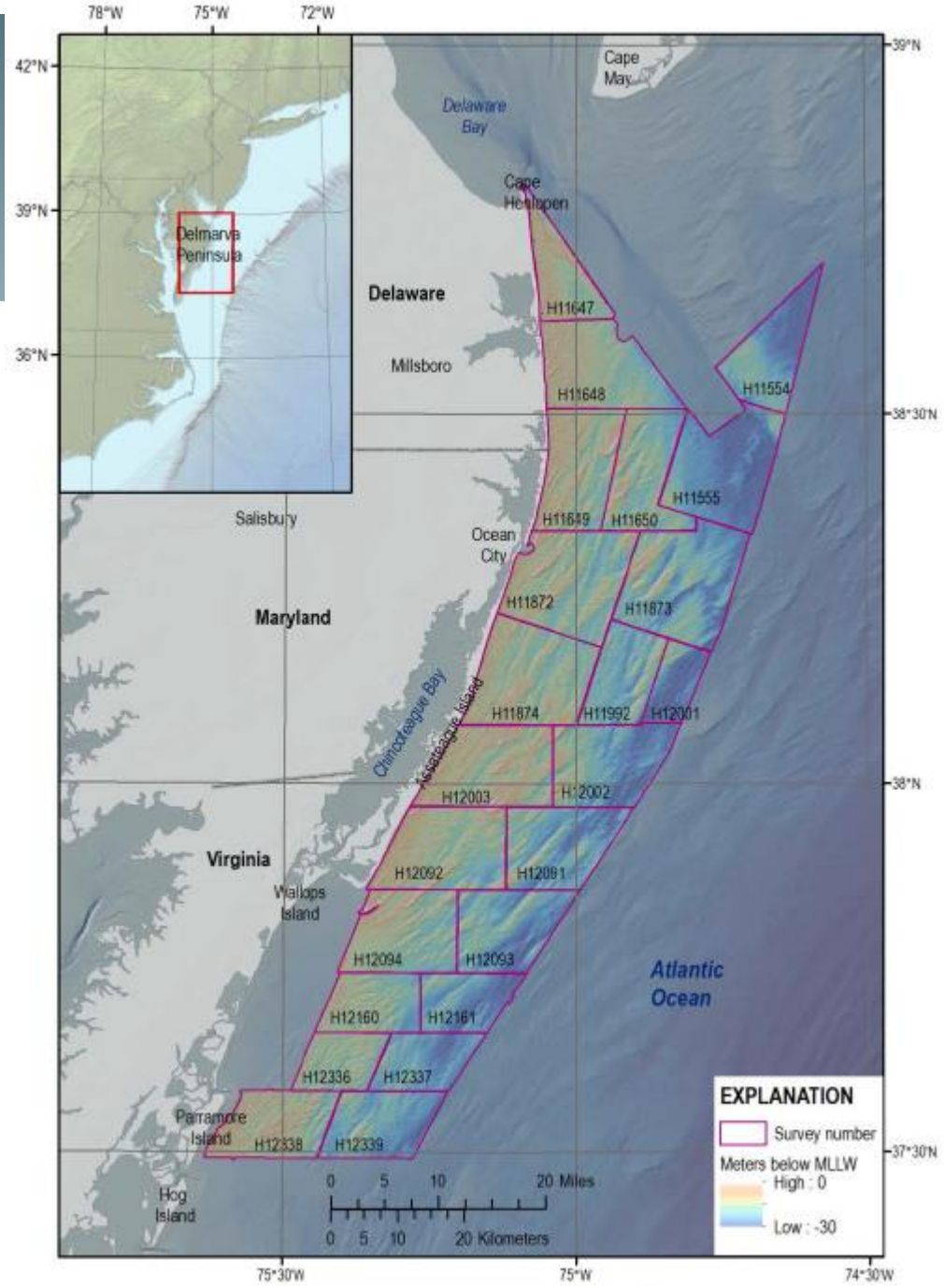


Figure 15 from "Atlantic Coastal and Inner Shelf". *The Geology of Virginia*

- Update our understanding of the Quaternary-Neogene geologic history of Virginia's Continental Shelf (VA-NC state line to Smith Island Shoals)
- Use Zircon to determine sediment provenance
- Examine OCS heavy mineral composition differences that may result in these successive paleochannels



Pendleton et al. 2014

For More information

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Work Cited

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* Pendelton, E., Brothers, L., Thieler, R., Danforth, W., Parker, C. 2014. National Oceanic and Atmospheric Administration Hydrographic Survey Data Used in a U.S. Geological Survey Regional Geologic Framework Study Along the Delmarva Peninsula. US Department of Interior. US Geological Survey. Open-File Report 1262.
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